TELEDYNE LECROY
Everywhereyoulook™

# quantumdata™ 980
# DisplayPort Video Generator / Protocol Analyzer Module
## Video Generation and Analysis Testing up to 5.4Gb/s Link Rates


## Key Features

- **Run functional tests on DisplayPort displays and monitors up to 5.4 Gb/s link rates with standard format library consisting of 600 standard timings and over 300 test patterns**
- **Run VESA Reduced Lane Count compliance tests on DisplayPort sources and displays**
- **Run HDCP 2.2 compliance tests on DisplayPort sources, sinks and repeaters**
- **NEW! Run DP 1.2 Core Link Layer compliance tests on DisplayPort sinks**
- **View EDID and DPCD registers of connected display to verify contents**
- **Configure link training parameters to test display's handling of various link training configurations**
- **Run audio tests using programmable LPCM sine wave audio tones**
- **Monitor Link training, HDCP and EDID over the Aux Channel with the Auxiliary Channel Analyzer feature**
- **Capture and decode main link metadata including main stream attributes and secondary data.**
- **View incoming video and metadata in real time**

**The Teledyne LeCroy quantumdata 980 DP1.2 Video Generator / Analyzer module supports video, audio and protocol functional testing of high-end DP displays and sources. The module supports HBR2 data rates including 1.63, 2.70 & 5.40 Gb/s on 1, 2 & 4 lanes on both its Tx ports and its Rx port. The module features two DisplayPort 1.2 outputs—both active simultaneously—for testing displays with multiple DisplayPort inputs. The DP1.2 module is equipped with all the standard video timings and test patterns necessary for testing modern displays.**

**The 980 DP Video Generator / Protocol Analyzer module can be equipped in either the 980B or 980R Advanced Test Platform. The module can be controlled either through the PC-based 980 GUI Manager or through the embedded 980 GUI Manager running on the 980 platform itself. The 980's built-in color touch screen provides a graphical user interface (GUI) to control the module.**

### Source Testing

The DP 1.2 module's optional Rx analyzer port emulates a DisplayPort 1.2 display device including EDID and DPCD emulation, Rx Link Training function and MST Rx function. The analyzer supports HDCP 2.2 compliance testing for DisplayPort 1.2 source devices. There are two options for the analysis function for testing DP 1.2 source devices:

- Basic Analyzer – Provides real time viewing of video and metadata for functional testing.
- Protocol Analyzer – Provides capture and store of the main link including main stream attributes and secondary data.

### Display Testing

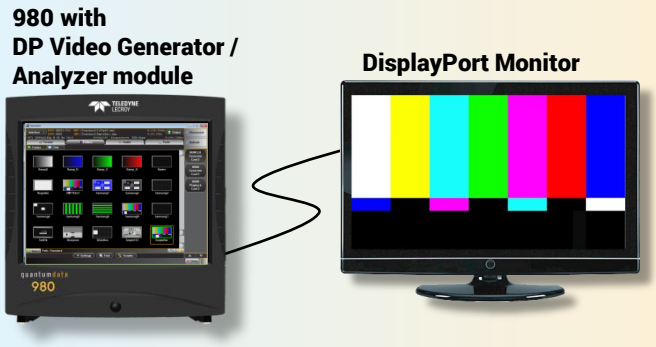
The 980 DP1.2 Video Generator module supports video, audio and protocol functional testing high-end DP 1.2 displays. The module supports HBR2 data rates including 1.63, 2.70 & 5.40 Gb/s on 1, 2 & 4 lanes on both its Tx ports and its Rx port. The module features two DisplayPort 1.2 outputs—both active simultaneously for testing displays with multiple DisplayPort inputs. The DP module is equipped with all the standard video timings and test patterns necessary for testing modern displays.

The DP video generator also supports HDCP 2.2 compliance testing for DisplayPort sink devices and link layer compliance testing for sink 1.2 devices.

# DISPLAY TESTS - VIDEO PATTERN TESTING FOR UHD TVS

## Video Testing

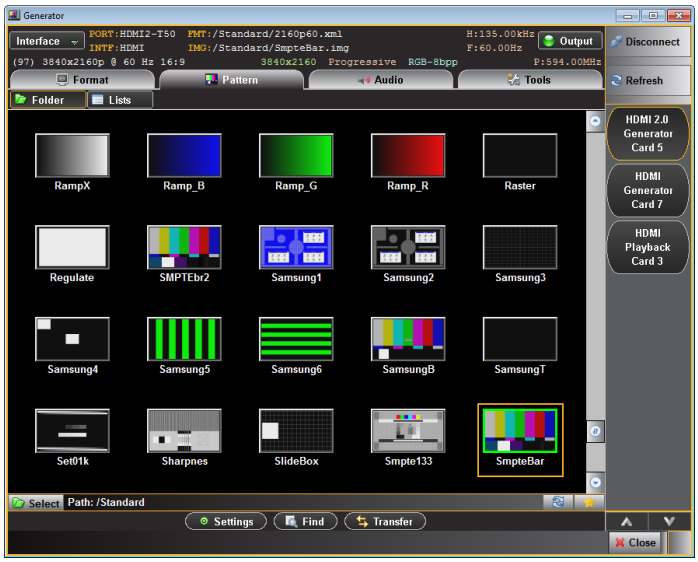
The 980 DP Video Generator / Analyzer module supports video and audio functional testing at link rates up to 5.4 Gb/s on 1, 2 and 4 lanes to support high resolution formats. The 980 DP Video Generator / Analyzer module has an extensive set of video formats and library of test patterns. You can set any pattern in motion to test motion artifacts with the Image Shift feature.




Test Setup for Sink Test

## Format Selection


## Test Pattern Selection




## Link Training Control and Configuration

The module's link training control feature enables you to configure the link training parameters during testing. You can set limits on the lane count and link rate and allow the link training engine to establish link training based on those limitations or you can force link training parameters—lane count, link rate, voltage swing, pre-emphasis.

## Audio Testing

The module offers a programmable LPCM audio sine wave generator enabling you to set the number of channels (up to 8), the amplitude, frequency, sampling rate and bit depth for uncompressed formats.

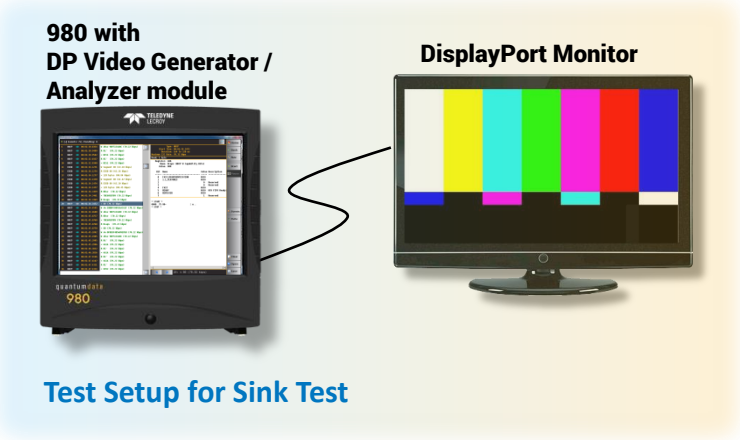
## LPCM Audio Testing


## Link Training Control and Configuration

# DISPLAY TESTS - PROTOCOL TEST FEATURES

## Protocol Testing

The 980 DP Video Generator module offers a variety of features for testing DisplayPort protocols. You can verify HDCP 1.3 and optionally HDCP 2.2 authentication transactions between the module's Tx port and a DP 1.2 display. The module's EDID Decode feature enables you to examine the EDID of the connected display in text. The DPCD Decode feature enables you to examine the DPCD registers of the connected display. You can read the EDID and/or the DPCD of downstream MST nodes.




Test Setup for Sink Test

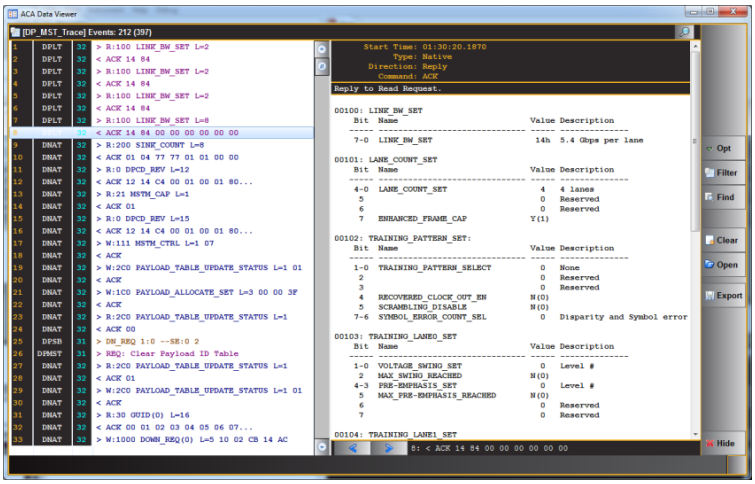
## Multi-Stream Transport

The DP1.2 Video Generator module emulates an MST source for testing an MST branch device or MST-capable monitor. Up to four (4) streams are supported with a depth of one. The Auxiliary Channel Analyzer (ACA) utility depicts the MST negotiations with the connected MST Rx device.

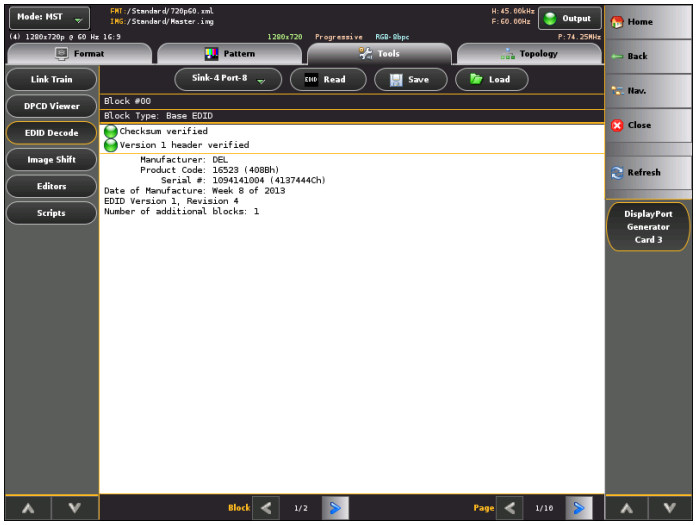
## Auxiliary Channel Analyzer

The 980 DP Video Generator / Analyzer module's Auxiliary Channel Analyzer (ACA) feature enables you to monitor the DP Aux Channel for link training and MST negotiations, HDCP transactions and EDID exchanges between the module and a connected display. The ACA logs these events and assigns precise timestamps to them. You can view the details of each transaction. These ACA logs can be saved and disseminated for further analysis by colleagues and other subject matter experts.

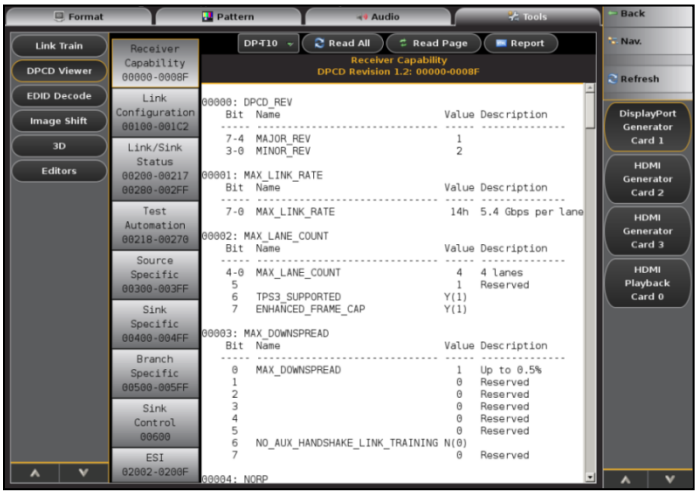
## Aux Channel Analyzer



## EDID Decode View



## SCDC Register View



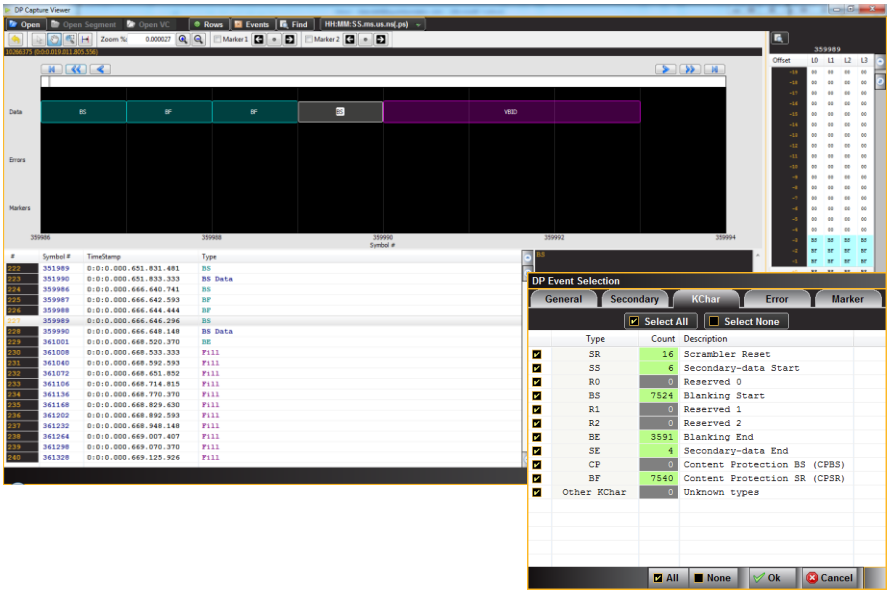
## HDCP 2.2 Test

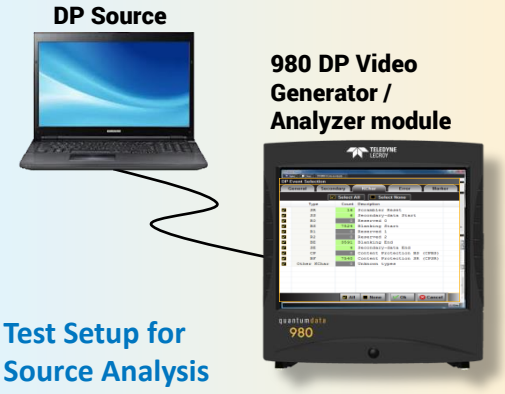
# SOURCE TESTS – CAPTURE & DECODE, PIXEL ERROR

## Capture and Decode

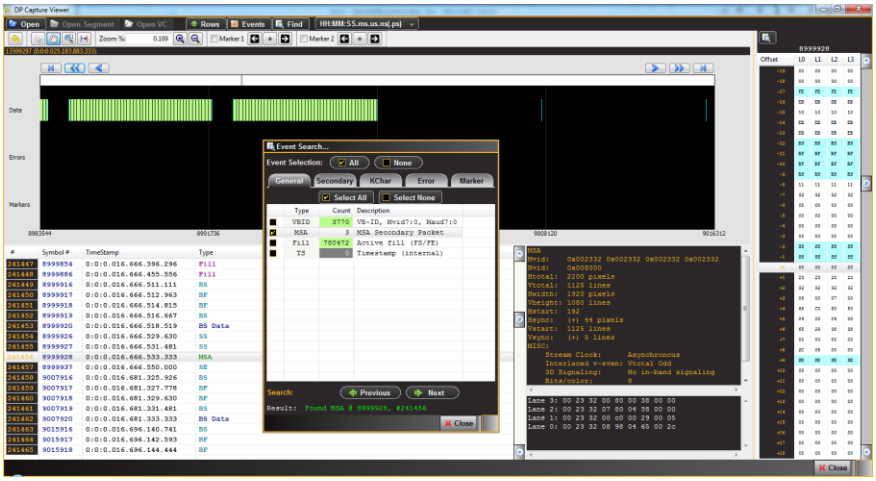
The 980 DP Video Generator / Analyzer module captures and decodes the main link attributes in order to diagnose interoperability issues related to them. The Protocol Analyzer captures and stores main link data and provides visibility into main stream attributes, secondary data elements, K-Characters and protocol errors. The Protocol Analyzer presents these elements on a graphical timeline and in a table. You can search for data and select any transaction in the table to view its details. The capture utility also enables you to capture specific MST streams from the source.

## Capture and Decode (Filter View)




## Capture and Decode (Search)



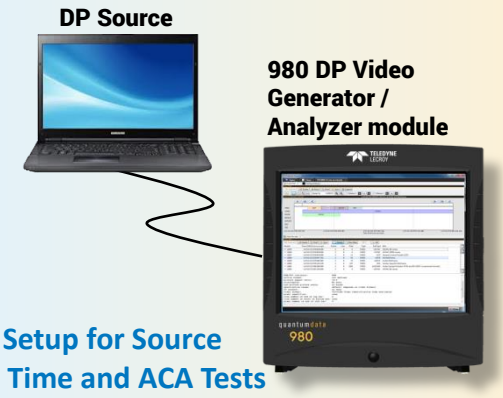
# SOURCE TESTS - REAL TIME & AUX CHANNEL ANALYSIS

## Real Time Analysis (Basic Analyzer)

The 980 DP Video Generator / Analyzer module 's Real Time analysis feature enables you to view the incoming video, lanes and link rate, timing, colorimetry and various other metadata in real time at a glance. The Real Time mode provides a basic confidence test to verify that the incoming video is essentially correct. The Rx port emulates any EDID on to test a source devices handling of various EDIDs. You can also configure DPCD registers for emulating on the DP Rx port using the DPCD Editor (below).

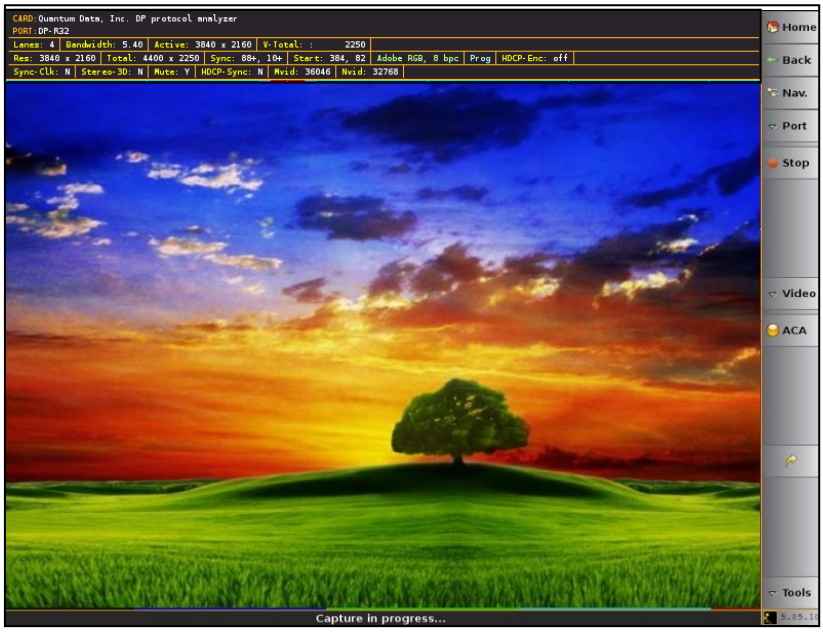
## Aux Channel Analyzer

The 980 DP Video Generator / Analyzer module's Auxiliary Channel Analyzer (ACA) feature enables you to monitor the DP Aux Channel for link training and MST negotiations, HDCP transactions and EDID exchanges between the module and a connected display. The ACA logs these events and assigns precise timestamps to them. You can view the details of each transaction. These ACA logs can be saved and disseminated for further analysis by colleagues and other subject matter experts.

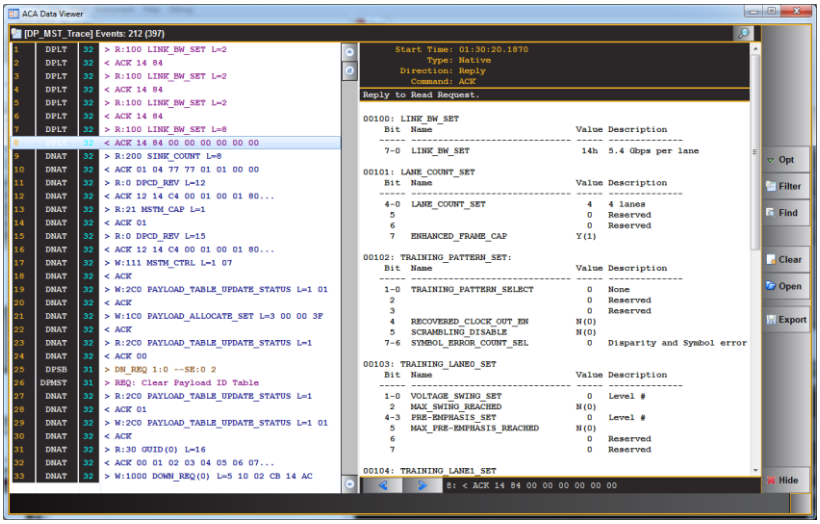



Test Setup for Source Real Time and ACA Tests

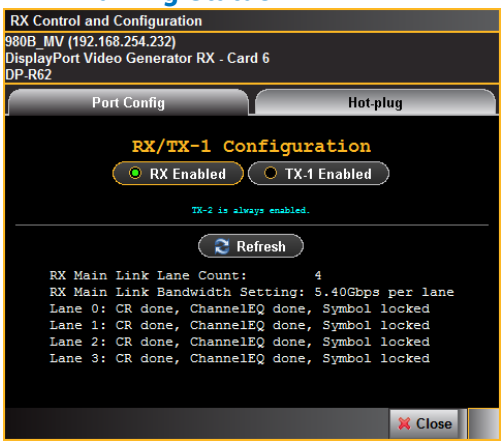
## Real Time Analysis




## Auxiliary Channel Analyzer




## Link Training Status

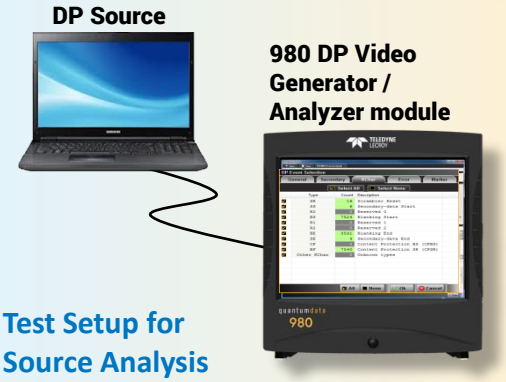



## DPCD Editor

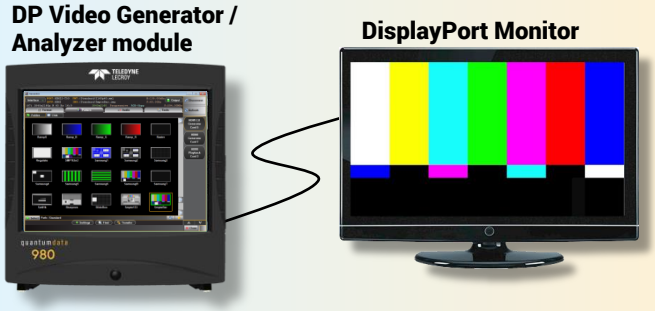
# HDCP 2.2 SOURCE, SINK & REPEATER COMPLIANCE

## HDCP 2.2 Compliance

The 980 HDCP 2.2 compliance tests are ideal for pre-testing your DisplayPort 1.2 source, sink or repeater product prior to submission to an Authorized Test Center for approval. Pre-testing provides assurance that your product will pass at the ATC when submitted. The compliance tests enable you to view the auxiliary channel analyzer traces logged during the test to help diagnose the cause of compliance test failures.

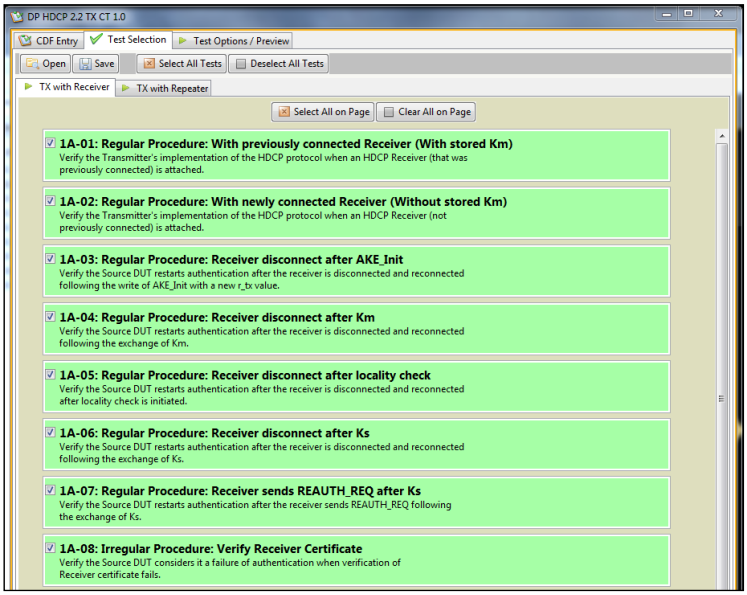



Test Setup for Source Analysis (Capture/Decode

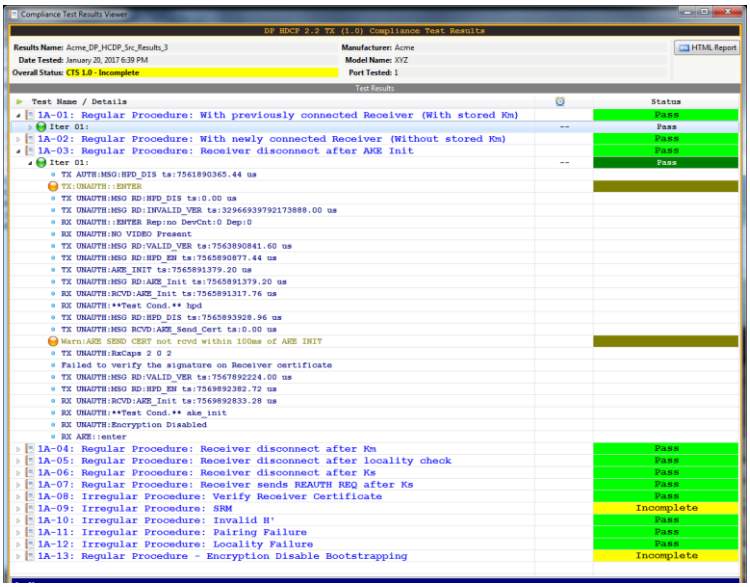



Test Setup for Sink Test

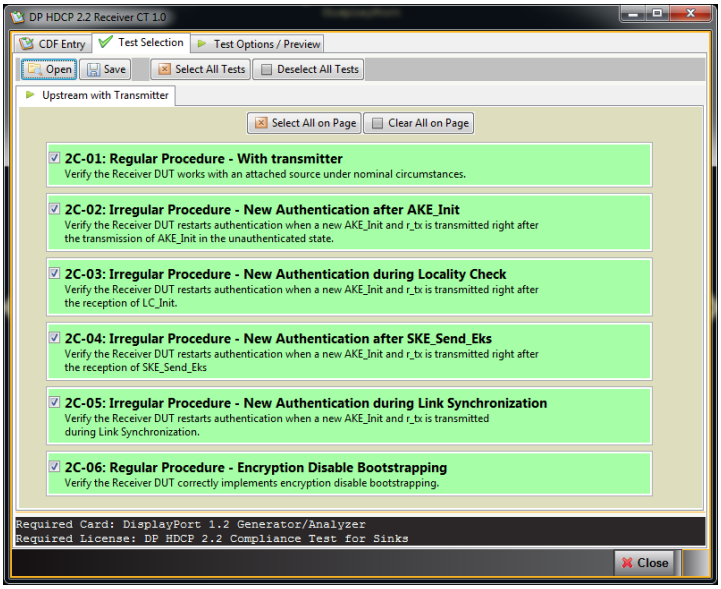
## HDCP 2.2 Source Tests - Test Selection



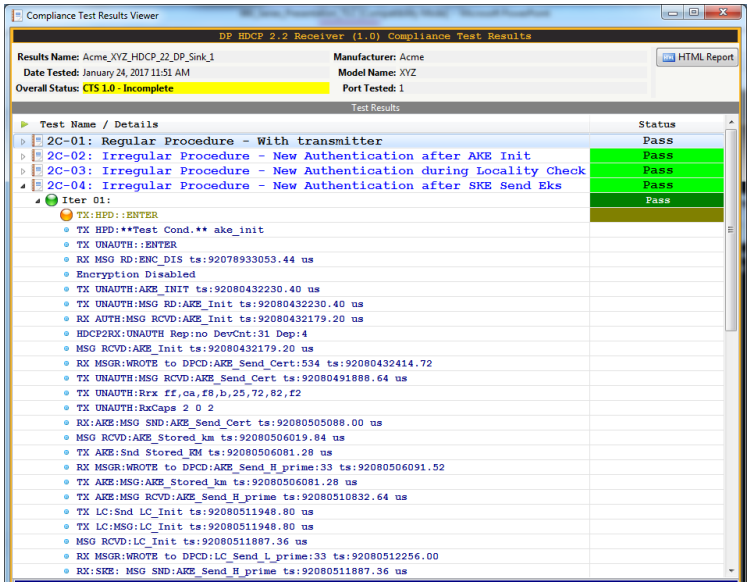

## HDCP 2.2 Source Tests - Test Results




## HDCP 2.2 Sink Tests - Test Selection



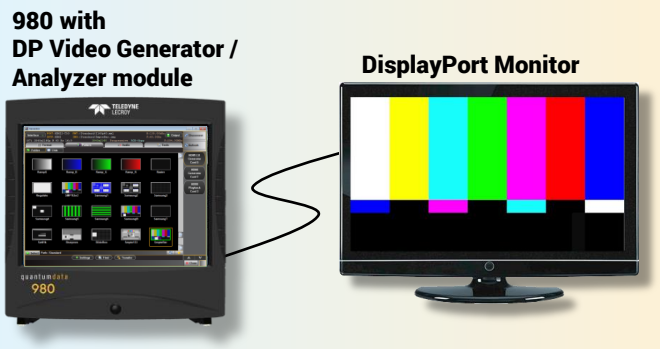

## HDCP 2.2 Sink Tests – Test Results



# LINK LAYER SINK COMPLIANCE

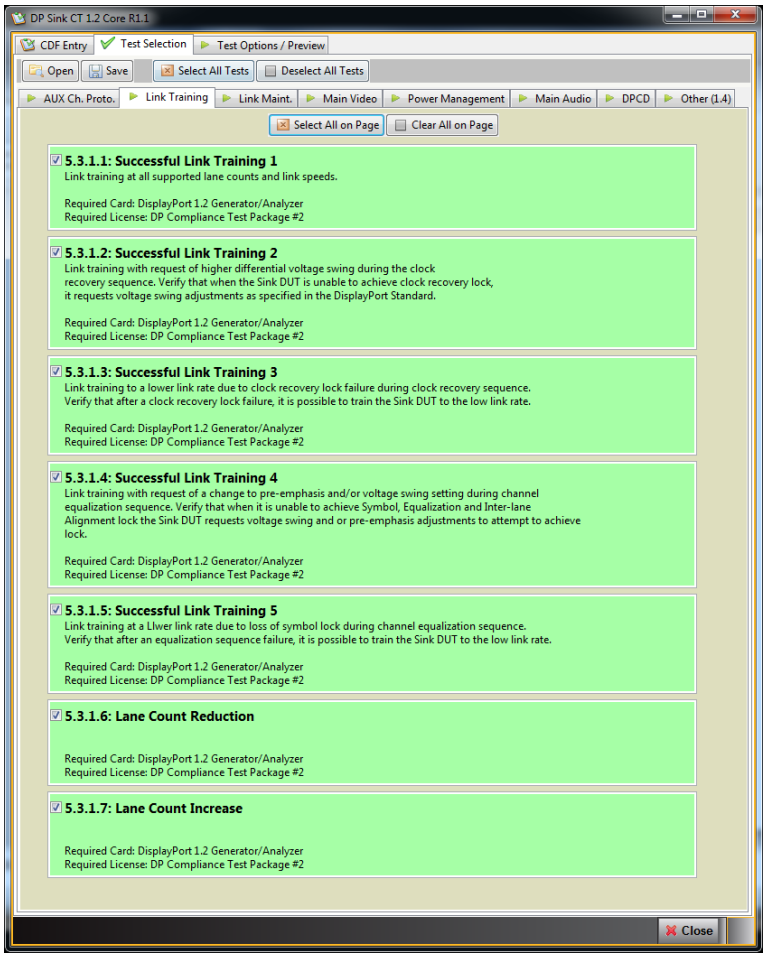
## DisplayPort Link Layer Compliance

The 980 DP sink (display) link layer compliance tests are ideal for pre-testing your DisplayPort 1.2 display product prior to submission to an Authorized Test Center for approval. Pre-testing provides added assurance that your product will pass at the ATC when submitted. Where permitted, you can self-test your product. Self-testing offers greater benefits for time to market and cost reduction than pre-testing by avoiding submission to the ATC for approval. The compliance tests (below right) enable you to view the captured data and detailed test results which help pinpoint the cause of compliance test failures. You can link to the aux channel traces in the Aux Channel Analyzer (ACA) to view the root cause of failures (below).

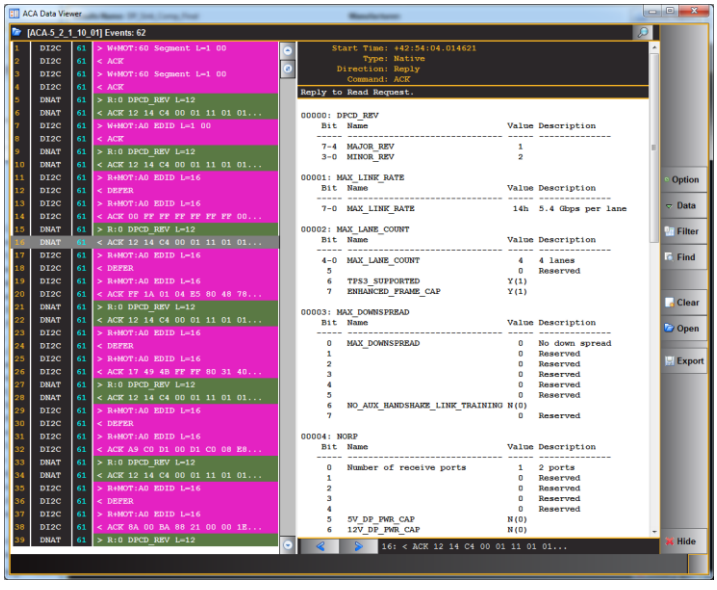



Test Setup for Sink Test

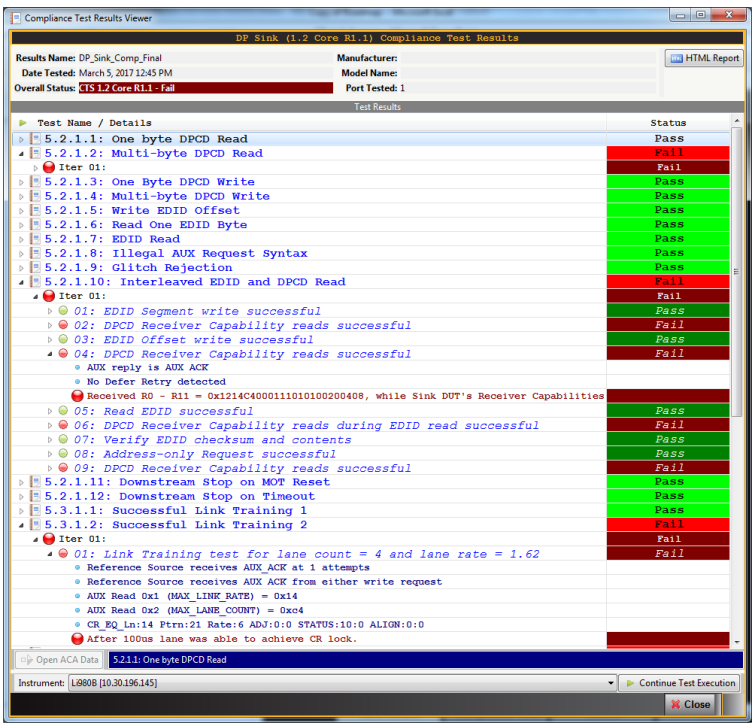
## DP 1.2 Core Link Layer Compliance - Test Selection




## DP 1.2 Aux Channel Traces – From LLC Test




## DP 1.2 Core Link Layer Compliance - Test Results



# SPECIFICATIONS

## DisplayPort Tx and Rx Ports

| | |
|---|---|
| Version | DisplayPort 1.2 |
| Standard Formats | VESA |
| Connectors | Tx (2) DP Standard; Rx (1) DP Standard |
| Protocol | DisplayPort |
| Video Data Rates | 1.62, 2.70, 5.40 Gb/s Link rates<br>1, 2, 4 Lanes |
| Color Depths | 8, 10, 12, 16 bits |
| Video Encoding | RGB, YCbCr |
| Video Sampling Modes | 4:4:4, 4:2:2 |
| HDCP | Versions 1.3 & 2.2 |
| Audio | 8 Channel LPCM programmable sine wave |
| Capture memory | 4 GBytes |

## Options

| | |
|---|---|
| DisplayPort Tx / Rx | Either or both:<br>- DP Tx for display testing<br>- DP Rx port, two options:<br>  - Basic Analyzer<br>  - Protocol Analyzer (requires Basic analyzer option) |
| DP Aux Channel Analyzer | Monitor DisplayPort Aux Channel transactions in real time either while emulating a source or sink |
| DP HDCP 2.2 Compliance | Run HDCP 2.2 compliance test on DisplayPort sources, sinks and repeaters |
| DP 1.2 Link Layer Compliance | Run DisplayPort 1.2 Core Link Layer compliance test on sinks (displays) |
| Compliance Reduced Lane Count | Compliance test for reduced lane count |

## 980 Test Platforms

| | |
|---|---|
| Embedded Display | 980B: 15” diagonal; Resolution: 1024(H); x 768 (V) resolution; 24 bit RGB color.<br>980R: 7” diagonal: Resolution: 800 (H) x 480 (V); 24 bit RGB color. |
| Power | 90-264 VAC, 47-63Hz |
| Weight | 23.76 LBS; 10.78 Kg |
| Size | 980B: Height: 15.25 in. (38.7 cm) Width: 14.57 in. (36.5 cm) Depth: 6.29 in. (15.9 cm)<br>980R: Height: 6.29 in. (15.9 cm); Width: 15.25 in. (38.7 cm); Depth: 14.57 in. (36.5 cm) |
| Command Line Control | Ethernet (RJ-45) for external GUI and telnet |
| Environmental | Operating Temp: 32 to 104 (F); 0 to 40 (C) |

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